DOCUMENT RESUME

ED 139 131 EC 100 706

AUTHOR Swanson, Lee
TITLE Effects of Verbal Coding on Learning Disabled and Normal Readers Visual Short-Term Memory.
PUB DATE Apr 77
NOTE 21p.; Paper presented at the Annual International Convention, The Council for Exceptional Children (55th, Atlanta, Georgia, April 11-15, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Cognitive Processes; Elementary Education; Etiology; Exceptional Child Research; *Learning Disabilities; Learning Processes; *Memory; *Reading Difficulty; *Verbal Stimuli; *Visual Learning

ABSTRACT

The hypothesis that reading difficulty of learning disabled (LD) children is attributable to deficiencies in verbal encoding was investigated with 60 LD and normal children (mean CA=9.1, mean IQ=103.5). Ss were compared on recall of a serial short-term memory task after pre-training of named and unnamed stimulus conditions. Data suggested that primary reading deficits in LD children are attributable to verbal encoding deficiencies (visual-verbal integration) and not in areas of visual learning as suggested by the perceptual-deficit hypothesis. (IM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED139131

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Effects of Verbal Coding on Learning Disabled and Normal Readers Visual Short-Term Memory

Lee Swanson

University of Northern Colorado

Running Head: Effects of Verbal Coding

EC100706

ABSTRACT

The present study investigated directly the hypothesis that reading difficulties of learning disabled children is attributable to deficiencies in verbal encoding. Adopting a probe-type serial memory task, normal and learning disabled readers matched on CA, IQ, and sex were compared on recall performance after pre-training of named and unnamed stimulus conditions. The named condition for normal readers was superior in terms of recall performance. While the effects of labels on learning disabled children's recall was negligible, recall was better in the unnamed than named condition for learning disabled readers. Consistent with Velluntino et al.'s (1972, 1973) findings with poor readers, no difference was found in recall of nonverbal stimuli between normal and learning disabled readers. These data suggest that primary reading deficits in learning disabled children are attributable to verbal encoding deficiencies (visual-verbal integration) and not in areas of visual learning as suggested by the perceptual-deficit hypothesis.

Effects of Verbal Coding on Learning Disabled and Normal Readers Visual Short-Term Memory

Popular explanations for reading failure in learning disabled children have been related to their difficulty to remembering visual stimuli. Specifically, visual-spatial recall difficulties due to a generalized perceptual deficit are believed by many investigators (e.g., Annapolle, 1967; Bender, 1938; Hermann, 1959; Kephart, 1960; Orton, 1937) to be a basic cause of reading disorders. This assumption that learning disabled children's visual short-term memory is faulty, has partly emanated from Orton's (1937) earlier observations of reading retardates with normal intelligence who had difficulty recalling newly presented words. Current studies (e.g. Bateman, 1968; Carroll, 1973; Friedman, note 1) have found a correlation between visual short-term memory and reading ability; therefore giving support to Orton's earlier observations. Proponents of the visual short-term memory deficit hypothesis have focused upon spatial organization (Rudel & Denckla, 1974; Symmes, 1972); difficulties in figure-group perception (Bender, 1938; Frostig, 1972) and attention to visual arrays (Koppitz, 1973). All have in common the suggestion that a specific reading disability is caused by deficiencies in visual-spatial short-term memory. Inherent in explanations of visual-spatial memory difficulties is the assumption that reading disability is the result of a perceptual deficit.

Although the relationship between memory for visual stimuli and reading acquisition is a logical one, Vellutino and colleagues (Vellutino, Steger, & Kandell, 1972; Pruzek, Steger, Meshoulan, 1973; Vellutino, Steger, DeSetto, & Phillip, 1975), have presented evidence which questions this assumption. In their investigations of children with reading difficulties, by employing unfamiliar

stimuli, controlling for initial group differences in intelligence, poor and normal readers were comparable on visual memory performance. Perhaps failure to find short-term memory differences between adequate and inadequate readers reflected sample definitions or matching procedures. Nonetheless, their consistant findings that poor readers do not differ from adequate readers on visual stimuli tasks raises serious questions as the the adequacy of a visual short-term memory deficit hypothesis (as well as a perceptual-deficit assumption) applied to learning disabled children. In a series of three studies (Vellutino, Steger & Pruzek, 1973; Vellutino, Harding, Phillips, & Steger, 1975; Vellutino, Steger, Harding, & Phillips, 1975) it was found that poor readers performed as well as normals on paired associate learning employing visual nonverbal stimuli, but not as well with verbal stimuli. Although they are inconclusive as to the precise nature of the disorder, these findings indirectly support the possibility that reading difficulties may be associated with deficiencies in verbal encoding. At present, there are no data which directly support the assumption that reading difficulties may be specific to linguistic in contrast to visual aspects of word learning.

The present investigation was designed to extend the findings of Vellutino et al. (1972, 1973, 1975) to learning disabled children with specific disabilities in reading. Since the previous studies focused upon non-learning disabled children with reading difficulties, there was need to compare these findings with diagnosed learning disabled children at an earlier grade level. Specifically, this experiment is different from the preceeding studies in terms of direct testing of the hypothesis that verbal encoding deficits (dysfunction in visual-verbal spatial integration) are a likely cause of reading disabilities. The present experiment was designed to examine experimentally the suggested

interaction of verbal coding with non-meaningful shapes and serial (visual-spatial) recall.

Method

Subjects and Design

Sixty normal and learning disabled children in 4 groups of 15 each, matched on CA, IQ, and sex, served as subjects in the experiment. Although several additional children (N=120) participated in the study, matching procedures of only learning disabled children with specific reading difficulties accounted for the small N in the statistical analysis. Children were selected from regular or special education classes in the Albuquerque (New Mexico) and Columbia (South Carolina) public school system. Both groups had a mean CA of 9.1 SD .26. The mean Otis-Lennon computed IQ scores for both groups were 103.5, SD 6.34. Classification of the learning disabled children was based upon the Nation Advisory Committee (note 2) definition, and the Appraisal and Review Committee in the represented public schools. Further selection included learning disabled children's reading scores who were below the 30th percentile equivalent based on Wide Range Achievement Test reading subtest scores (Jastak & Jastak, 1965) and subtest scores of Reading Recognition and Reading Comprehension of the Peabody Individual Achievement Test (Dunn & Markwardt, 1970). Selection criteria for normal readers was a standardized reading test score at grade level or above. Children were screened for visual-motor, auditory, and visual acuity problems based upon psychological and medical examination records. None of the children in this experiment were on medication.

Children in both reading groups were assigned for participation in named and unnamed stimulus conditions. Two groups (Disabled and Normal readers) and two training conditions (named and unnamed), and six serial positions

were used with repeated measures on serial position. Children were trained and tested individually. During training, 15 children from both the learning disabled and normal reading group were assigned to the named condition, where they learned names for shapes, while remaining children in the unnamed condition had equal practice in discriminating both top and bottom contours of the shapes in a matching to sample task, but were not given names. Children in the named condition gave the name of the test shape when it was shown, with correction after three seconds. Training continued until children could label correctly 12 consequentive presentations of the shapes. All children met pre-testing criteria.

Stimuli

Stimuli were six nonsense random shapes selected from Vanderplas and Garvin's (1959) eight-point assortment. These shapes (Number 19, 20, 24, 25, 26) were chosen because of their low "association" and "content" values as established by Vanderplas and Garvin's (1959) norms. Figures were of lower association value than Ross and Youniss's (1969) nonverbal item classification. Each of the shapes used was drawn in black ink on a 10 x 10 cm white card with the same dimensions as the normed shapes. Labels were assigned to each of the shapes such that the label was a meaningful "representation" of the shape to some extent (see Figure 1).

INSERT FIGURE 1 ABOUT HERE

Procedure

Atkinson et al. (1964) probe-type serial memory task, similar to that used in Swanson and Watson, (1976); and Swanson (note 3) study was used in this investigation. Main differences in the present investigation was that coded unfamiliar items were used and a training period was given to meet labeling

criterion. Six different shapes were presented singly for 2 sec each, one at a time. Shapes were then put in a face down array after exposure. Once the stimulus array had been presented, a duplicate shape (probe item) was then shown and the child was asked to point out the corresponding shape in the presentation series.

Twelve trials were presented in each session. Each trial consisted of 6 shapes selected randomly for each serial position with the stipulation that each position would be correct two times, and no shape would be correct more than twice or less than once over the 12 trials. Stimulus was presented from the child's right to left so that spatial and presentation positions were confounded. Approximate length of each session was 30 minutes.

Results

The proportion of correct responses constituted the overall memory measure. The proportion of correct response by serial position are presented in Figure 2. To simplify the figure, adjacent serial positions were paired (1-2, 3-4, 5-6). A three-way analysis of variance for normal and learning disabled readers, label vs no label conditions and six serial positions

INSERT FIGURE 2 ABOUT HERE

(repeated measures) was performed. Scores corrected for guessing (proportion of times a position was chosen and was correct/proportion of times that position was chosen) exhibited the characteristically found response bias for middle positions.

Overall, the correct recall of probed serial positions was more difficult for the learning disabled than normal readers, as reflected in the task main effect, F (1,56) = 10.92, $p < .01$. The main effect of name training was significant, F (1,56) = 7.81, $p < .01$, but group effects, as shown in Figure 2, were

obscured by an interaction of group x task(name vs unnamed) training, F (1,56) = 20.57, $p < .001$. Tests of simple main effects indicated that name training influenced performance on the recall task for normal readers, F (1,280) = 46.17, $p < .01$, while overall unnamed recall performance for the learning disabled reader was better compared to named conditions (not significant, F (1,280) = 3.71, $p > .05$). As shown in Figure 2, no significant differences in recall performance was found between reading groups for the unnamed conditions, $F < 1$. Thus the conclusions of Vellutino et al. (1975) that reading disability cannot be attributed to a deficiency in visual memory was confirmed.

The main effect of serial position was also significant, F (5, 280) = 4.18, $p < .01$, while the interactions of condition by serial position did not reach significance. A Newman-Keuls comparison of all pairwise differences on the recall task indicated that the recency positions (paired comparison of positions 5 & 6 > 3 & 4) in named and unnamed condition accounted for the significant ($p < .05$) serial position main effects. There was a lack of primacy effect (positions 1 & 2 > 3 & 4) in both the named and unnamed learning disabled children's recall performance. A reanalysis of response scores converted to d' measures (see Hochhaus, 1972; Swanson, note 3) using the same overall statistical procedures yielded similar main, interaction, and simple-main effects. The Newman-Keuls test indicated, however, a significant ($p < .05$) primacy effect for the named learning disabled child's recall performance, but not unnamed condition, consistant with other serial position studies (e.g., Swanson, note 3) Thus, it is apparent that on the verbal and visual recall task employed in the present study no general response pattern accounting for recall difference unique to either learning disabled or normal readers group is evident.

Discussion

Vellutino and colleagues (1973, 1975) have consistently argued against the visual-memory deficit hypothesis of reading dysfunction. Present experimental results of the study provide direct support for their generalizations with non-learning disabled poor readers to a learning disability sample. Learning disabled children with specific reading disabilities performed as well as normals on a nonverbal visual-spatial short-term memory recall task. Visual memory was not a significant cause of a specific reading disability, indicating no basic dysfunction in visual perception. Learning disabled readers and normal readers were comparable in serial recall response patterns.

In place of the visual short-term memory deficit assumption, this experiment investigated directly the hypothesis that verbal encoding (visual-verbal spatial integration) difficulties may be associated with reading difficulties in learning disabled children. Labels of nonfamiliar random shapes led to significant improvement in recall for normal readers while the effects of labels on learning disabled children's recall was negligible. Althought not significant, recall was better in the non label than labeled condition for learning disabled readers. The current findings affords direct support that primary reading disability is attributable to a dysfunction in visual-verbal integration and not in areas of visual learning as suggested by the perceptual-deficit hypothesis (e.g., Anapolle, 1967; Orton, 1937; Kephart, 1960; Koppitz, 1973).

These data are perhaps best overall interpreted by assuming that labels serve to integrate a visual representation and improve the retrievability of the various stimulus features for normal readers, while labels for learning disabled readers can be viewed as a mediator to which stimulus features were not associated. Naming for the learning disabled reader did not provide the

basis for an integrated representation and thereby increase the retrievability of visual information. Some support for this finding comes from suggestive literature which indicated that a reading disability is a manifestation of specific linguistic problems such as phonemic segmentation (e.g., Shankweiler & Liberman, 1972), verbal concept deficiency (e.g., Blank, Weider, & Bridger, 1968), or mediational inefficiencies(Swanson, note 3).

The practical application of this study seriously questions the validity of commonly practiced techniques remediation in visual perception for learning disabled readers. The poor record of visual perceptual training programs based upon the perceptual deficit hypothesis may be attributed to the fact that learning disabled children do not need these skills. Further, it would seem that the role of visual-spatial short-term memory in producing reading retardation has been over-estimated. There is evidence that such dysfunctions and remediation procedures may characterize the young child, but even that evidence is mixed. Finally, I would like to emphasize that the present findings can only be generalized to learning disabled children within the age and grade ranges which characterized my sample. The present study calls for a remediation focus on verbal encoding abilities.

Reference Notes

1. Friedman, R. Short-term recognition memory in normal and disabled readers. Unpublished paper presented at the 10th International Conference of the Association for Children with Learning Disabilities, March 16, 1973.
2. National Advisory Committee on Handicapped Children. Special Education for Handicapped Children. First Annual Report. Washington D.C.: U.S. Department of Health, Education, and Welfare, January 31, 1968.
3. Swanson, L. Nonverbal visual short-term memory as a function of age and dimensionality in learning disabled children. Child Development, 48, in press.

References

Anapolle, L. Visual training and reading performance - Journal of Reading, 1967, 10, 372-382.

Atkinson, R., Hansen, D. & Berbach, H. Short-term memory with young children. Psychonomic Science, 1964, 1, 255-256.

Bateman, B. Interpretations of the 1961 I.T.P.A. Seattle: Special Child Publications, 1968.

Bender, L. A visual motor Gestalt test and its clinical use. American Orthopsychiatry Association Research Monograph, 1938, No. 3.

Blank, M. & Bridger, W. Perceptual abilities and conceptual deficiencies in retarded readers. In Psychopathology of Intelligence (J. Zubin, Ed.), New York: Grune & Stratton, 1967.

Carroll, J. Assessment of short-term visual memory and its educational implications, Perceptual and Motor Skills, 1973, 37, 383-388.

Dunn, L. & Markwardt, F. Peabody Individual Achievement Test, Circle Pines, Minn.: American Guidance Services, Inc. 1970.

Frostig, M. Visual perception, integrative functions and academic learning. Journal of Learning Disabilities, 1972, 5, 1-15.

Hermann, K. Reading disability. Copenhagen, Denmark: Munksgaard, 1959.

Hochhaus, L. A table for the calculation of d' and B. Psychological Bulletin, 1972, 77, 375-376.

Jastak, J. & Jastak, S. The Wide Range Achievement Test, Wilmington: Guidance Associates, 1965.

Kephart, N. Slow learner in the classroom. Charles Merrill, Columbus, Charles Merrill, Columbus, Ohio, 1960.

Koppitz, E. Visual aural digit span test performances of boys with emotional and learning problems. Journal of Clinical Psychology, 1973, 29 , 463-466.

Orton, S. Reading, Writing, and Speech Problems in Children. New York: W.W. Norton, 1937.

Ross, B. & Youniss J. Ordering of nonverbal items in children's recognition memory. Journal of Experimental Child Psychology, 1969, 8, 20-32.

Rudel, R. & Denckla, M. Relation of forward and backward digit repetition to neurological impairment in children with learning disabilities, Neuropsychologia, 1974, 12, 109-118.

Shankweiler, D. & Liberman, I. Misreading: a search for cues. In Language by ear and by eye: the relationships between speech and reading. (J. Kavanaugh & I. Mattingly, Eds.) Cambridge, MA: MIT Press, 1972.

Swanson, L. & Watson, B. Dimensional salience and short-term memory recognition in mentally retarded children. Perceptual and Motor Skills, 1976, 42, 1153-1166.

Symmes, J. Unexpected reading failure, American Journal of Ortho-Psychiatry, 1972, 42, 82-91.

Vanderplas, J. & Garvin, E. The association value of random shapes. Journal of Experimental Psychology, 1959, 57, 147-154.

Vellutino, F. Pruzek, R., Steger, J. & Meshoulam, U. Immediate visual recall in poor and normal readers as a function of orthographic-linguistic familiarity, Cortex, 1973, 9, 370-386.

Vellutino, F., Steger, J., DeSotto, L., & Phillips, F. Immediate and delayed recognition of visual stimuli in poor and normal readers, Journal of Experimental Child Psychology, 1975, 19, 223-232.

Vellutino, F., Steger, J., & Kandel, G. Reading disability: an investigation of the perceptual deficit hypothesis, Cortex, 1972, 8, 89-104.

Footnote

The research herein was support by a Faculty research grant at the University of Northern Colorado. Appreciation is due to the Albuquerque (New Mexico) Public School System and the Richland 1 School District, Columbia, South Carolina. Requests for reprints should be sent to Lee Swanson, Department of Special Education, Greeley, Colorado, 80639.

Figure Caption

Figure 1. Stimulus shapes and labels.

Figure 2. Proportion of correct response as a function of reading ability, named and unnamed stimulus and serial positions.

Tooth

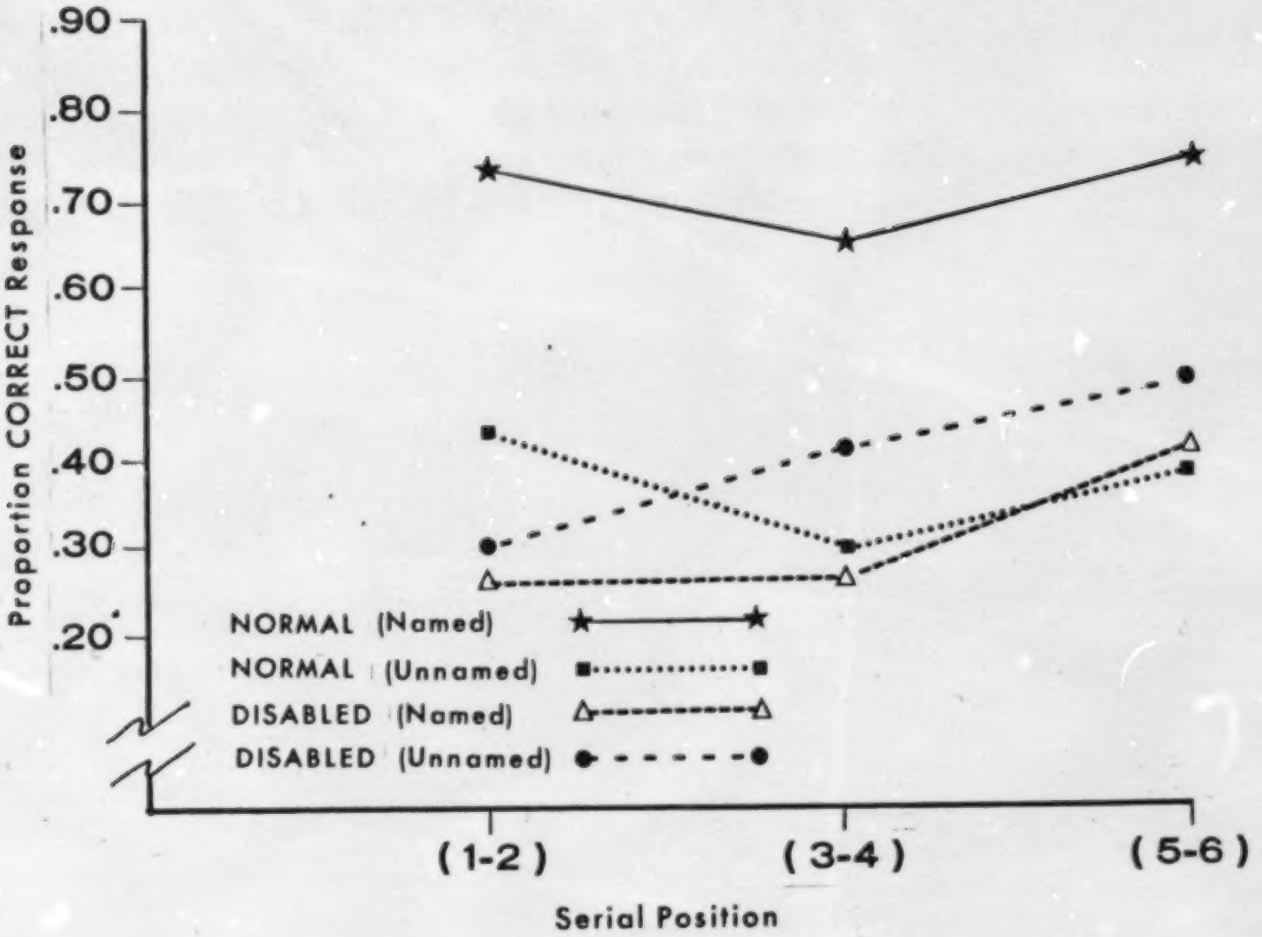
Bird

Tree

Rock

Badge

Helmet


.90
.80
.70
.60
.50
.40
.30
.20
Proportion CORRECT Response
NORMAL (Named)
NORMAL (Unnamed)
DISABLED (Named)
DISABLED (Unnamed)
(1-2)
(3-4)
(5-6)
Serial Position